

REMARKS

Claims 1-38 are pending in this application.

Claims 12-13, 19, 22 and 32 are objected to.

Claims 1-1, 14-18, 20-21, 23-31 and 33-38 are rejected.

The office action dated April 23, 2007 indicates that claims 17, 20 and 31 are objected to for containing typographical errors. Claims 17, 20 and 31 have been amended to correct these errors. The examiner is thanked for identifying these typographical errors.

The office action objects to claim 21 because "the demosaic image" lacks antecedent basis. Claim 21 has been amended to change "demosaic" to "output." Claim 20 provides antecedent basis for "the output image."

The office action rejects claims 22 and 32 under 35 USC § 112, second paragraph because the term "the intensity gradient" lacks antecedent basis. Claims 22 and 32 have been amended to recite "an intensity gradient" instead of "the intensity gradient." Therefore, the '112 rejection should be withdrawn.

The office action rejects claims 1-8, 10, 11, 14-18, 23-30 and 33-38 under 35 USC §102(e) as being anticipated by Kakarala U.S. Patent Application Publication 2005/0052981. The rejection is respectfully traversed.

Claim 1 recites a method of processing a digital image that includes interpolating values of a first color at pixels where the first color was not sampled. The interpolation of the first color value at a given pixel includes determining *likelihoods* of the given pixel belonging to the same region as each of at least two other pixels having sampled values of the first color, the other pixels in

different directions relative to the given pixel; and using the likelihoods and the sampled values of the other pixels to interpolate the first color at the given pixel.

Kakarala does not teach or suggest determining likelihoods, let alone the likelihoods recited in claim 1. Kakarala states that within an image "there are many edges where the light intensity changes sharply. In order to produce a sharp output image, color interpolation should be directed along edges rather than across them (paragraph 33, lines 6-10). To realize this, Kakarala discloses an algorithm that *estimates the orientation of an edge, and determines whether a pixel lies on that edge* (paragraph 33, lines 10-12). Each pixel is interpolated by "separately considering the degree of change (e.g., the gradient, the Laplacian or other measure of the degree of change) in both the horizontal and vertical directions in at least two of the color planes" (see paragraph 16, lines 1-6). The ***degree of change*** is used to determine whether interpolation is performed in the horizontal direction, or the vertical direction, or in both directions (see paragraphs 76, lines 6-12 and 81, lines 5-8). No likelihoods are computed. In contrast, the method of claim 1 includes determining ***likelihoods*** of a given pixel belonging to the same region as each of at least two other pixels having sampled values of the first color.

The office action cites paragraph 58 of Kakarala and alleges that a "degree of fit λ " is a likelihood of a given pixel belonging to the same region as each of at least two other pixels having sampled values of the first color. However, Kakarala doesn't support the allegation. According to Kakarala's paragraph 58, the degree of fit is simply the degree to which a principal vector fits the three (red, green and blue) gradients at a pixel. As paragraph 57 explains, the principal vector (of a Jacobian of the color planes) is a vector that provides the largest direction of variation for a color image. Kakarala's degree of fit relates to an *estimation of edge orientation*.

This estimation of edge orientation may be measured as $\lambda = s_2/(s_1+s_2)$ (equation 9). According to paragraph 55, s_1 and s_2 are singular values of a singular value decomposition (SVD) of the Jacobian.

Clearly, Kakarala does not teach or suggest determining likelihoods and using the likelihoods to interpolate a color at a given pixel. Therefore, claim 1 and its dependent claims 2-22 should be allowed over Kakarala.

Claim 8 should be allowed for the additional reason that Kakarala does not teach or suggest applying a similarity function to differences between sampled values. The office action alleges that equation 9 of Kakarala is a similarity function. However, Kakarala does not support the allegation. According to Kakarala, equation 9 simply measures the degree to which a principal vector fits the red, green and blue gradients at a pixel (paragraph 58).

Claim 23 also recites determining likelihoods of neighbors belonging to the same region as the given pixel, and using the likelihoods and the sampled values to interpolate a first color value for the given pixel. For the reasons above, claim 23 and its dependent claims 24-32 should be allowed over Kakarala.

Claim 33 recites apparatus comprising means for using sampled values in a color plane of a mosaic image to determine the likelihoods of a given pixel belong to the same region as at least two different neighbors lying in different directions, and means for using the likelihoods and sampled values in the different directions to interpolate a value at the given pixel. For the reasons above, claim 33 and its dependent claim 34 should be allowed over Kakarala.

Claim 35 recites a digital camera that performs image processing. The processing includes determining the likelihoods of neighbors belonging to the same region as a given pixel, and using the likelihoods and sampled values of

the neighbors to interpolate a color at the given pixel. For the reasons above, claim 35 and its dependent claim 36 should be allowed over Kakarala.

Claim 37 recites an article for instructing a processor to process a mosaic image. The article comprising memory encoded with instructions for instructing the processor to interpolate missing values of a first color, the interpolation including determining likelihoods of neighbors having sampled values of the first color being in the same region as a given pixel, and using the sampled values and the likelihoods of those neighbors to interpolate the first color at the given pixel. For the reasons above, claim 37 and its dependent claim 38 should be allowed over Kakarala.

The office action rejects claims 37-38 under 35 USC §101 as being non-statutory because these claims do not recite computer memory. The '101 rejection is traversed. MPEP2106.01 (Computer-related Nonstatutory Subject Matter) draws a distinction between "functional descriptive material" and "nonfunctional descriptive material," it does not draw a distinction between computer memory and other types of memory. Therefore, the office action provides no legal basis for rejecting claim 37. Further, the reasoning behind the '101 rejection is flawed. The office action posits that claim 37 could read on paper. However, it provides no legal support for the holding that paper is nonstatutory subject matter. The office action also posits that claim 37 could read on a program contemplated and memorized by a person. However, no such concern exists, for claim 37 explicitly recites memory that is programmed to instruct a processor (not a person). For these reasons, the '101 rejection of claims 37-38 should be withdrawn.

The examiner is respectfully requested to withdraw the rejections of the claims. The examiner is encouraged to contact the undersigned to discuss any issues that might remain.

Respectfully submitted,

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